NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, DC 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA08MM004

By
Christopher Babcock

WARNING

The reader of this report is cautioned that the transcription of a voyage data recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
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April 4, 2008

Voyage Data Recorder Factual Report

Group Chairman's Factual Report
By Christopher Babcock

A. EVENT

Location:	San Francisco, CA
Date:	November 7, 2007, 0830 Pacific Standard Time (PST)[1]
Vehicle:	*M/V Cosco Busan*, International Maritime Organization (IMO) #9231743
Operator:	Fleet Management Limited
NTSB Number:	DCA08MM004

B. GROUP

A group was convened on November 27, 2007.

Chairman:	Christopher Babcock Vehicle Recorder Specialist National Transportation Safety Board
Member:	Captain Steven D. Brown American Pilots Association
Member:	Captain R. W. Holly Field Operations Supervisor California Department of Fish and Game
Member:	LTJG Jacob Hopper Investigating Officer United States Coast Guard
Member:	Captain Richard Hurt San Francisco Bar Pilots
Member:	Captain Rob Jones Marine Safety Investigator National Transportation Safety Board

[1] All times are referenced to local PST

Member: Captain S. T. Harlan Li
Marine Accident Investigation Section
Government of Hong Kong Marine Division

Member: Nagarajan M. S.
General Manager
Fleet Management Limited

Member: Lieutenant Kris Szczechowicz
Assistant Senior Investigating Officer
United States Coast Guard

Mandarin Chinese translation assistance was provided by:

Captain S. T. Harlan Li
Marine Accident Investigation Section
Government of Hong Kong Marine Division

He Ning
Staff Assistant
National Transportation Safety Board

Michael Yan
Staff Translator
United States Department of State

C. SUMMARY

On November 7, 2007, at approximately 0830 PST, the Hong Kong flag vessel *M/V Cosco Busan*, a 900-foot container ship operated by Fleet Management Limited, with a complement of 24 crew, allided with the delta tower of the San Francisco-Oakland Bay Bridge while en route from the Port of Oakland berth 56 to Busan, South Korea. The 65000 gross ton vessel sustained signifigant damage to the hull and internal structure and released approximately 58000 gallons of bunker fuel into the San Francisco Bay. No injuries were reported to the crew

D. DETAILS OF INVESTIGATION

On June 11, 2007, the NTSB Vehicle Recorder Division's Audio Laboratory received information from the following simplified voyage data recorder (S-VDR):

Recorder Manufacturer/Model: **SAM Electronics S-VDR**
Recorder Serial Number: **unknown**

Recorder Description

According to Chapter V of the International Convention for Safety of Life at Sea (SOLAS) Regulation 20 and federal regulations, S-VDRs are required aboard all cargo

vessels of 20000 gross tons and upwards constructed before July 1, 2002, by the first dry-docking after July 1, 2006, but no later than July 1, 2009.

S-VDRs are required to store the last 12 hours of bridge audio, radar, and IEC 1162[2] National Marine Electronics Association (NMEA) parametric data in crash protected memory units. Means must also "be provided whereby recorded data may be saved after an incident with minimal interruption to the recording process."[3]

Recorder Damage

The VDR suffered no damage during the grounding and remained aboard the vessel. Safety Board investigators downloaded all stored data onto a portable hard drive which was returned to the Safety Board's Surface Recorder Laboratory.

VDR Contents Description

A single archive was downloaded from the S-VDR containing approximately 25 hours of bridge audio, radar, and parametric data.

The S-VDR aboard the *Cosco Busan* records one channel of mixed audio drawn from four SAM Electronics VS2053A microphones on the bridge, one channel of mixed audio drawn from a microphone on each bridge wing, and two channels drawn from two separate VHF frequencies. Microphones are located at the port and starboard side of the front desk, the chart table, aft bridge area, and the port and starboard bridge wings. The bridge audio ranges from fair to good quality[4]. Portions of the audio were unintelligible due to the close proximity of VHF radio speakers to the S-VDR microphones. Multiple conversations close to one or more microphones also masked relevant bridge audio. See the "Group Chairman's VDR Transcript" for a transcription of the relevant audio recovered from the S-VDR.

Post-display selection radar imagery[5] from the Sperry Marine 3-centimeter radar is captured every 15 seconds and stored to the S-VDR as a compressed bitmap image. The images stored to the S-VDR show the exact radar image displayed to the crew on the bridge including targets, ranges, and settings. The status and display of other radar systems that may have been in use is not recorded, nor are they required to be. Uncompressed radar images may be found in the public docket under separate cover.

Vessel parametric data is recorded as NMEA sentence fields. The following valid NMEA fields were recorded:

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[2] IEC Document 1162 – Maritime Navigation and Radiocommunication Equipment and Systems – Digital Interfaces

[3] IMO Assembly Resolution MSC.163(78) Performance Standards for Shipborne Silmplified Voyage Data Recorders

[4] See attached audio quality scale

[5] Post-display selection radar imagery includes "electronic signal information…which was actually being presented on the master display of the radar at the time of recording. This shall include any range rings or markers, bearing markers, electronic plotting symbols, radar maps, whatever parts of the of the SENC (system electronic navigation chart) or other electronic chart or map that was selected, the voyage plan, navigational data, navigational alarms and the radar status data that were visible on the display." (IEC 61996-2, Simplified Voyage Data Recorder (S-VDR) Performance Requirements)

- time and date
- heading and speed (SOG) over ground
- AIS (Automatic Identification System)
- geographic position
- rate of turn

Figure 1 and Figure 2 show parametric data overlaid with pertinent audio. Figure 3 shows the ground track of the vessel from berth to the point of allision while Figure 4 shows the ground track along with pertinent audio.

Timing and Correlation

Timing on the transcript was established by converting the audio file time reference recorded as Universal Coordinated Time (UTC) to local PST. Radar and parametric data were time stamped similarly. Because the audio, radar, and parametric data all share a common time reference no further correlation was necessary.

Christopher Babcock
Vehicle Recorder Specialist
Vehicle Recorder Division

Audio Quality Rating Scale

The levels of recording quality are characterized by the following traits of the voyage recorder information:

Excellent Quality — Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous bridge/radio transmissions that obscure each other.

Good Quality — Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous bridge/radio transmissions that obscure each other.

Fair Quality — The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by bridge noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the VDR system that distorts or obscures the audio information.

Poor Quality — Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high bridge noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the VDR system that severely distorts or obscures the audio information.

Unusable — Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the VDR system.

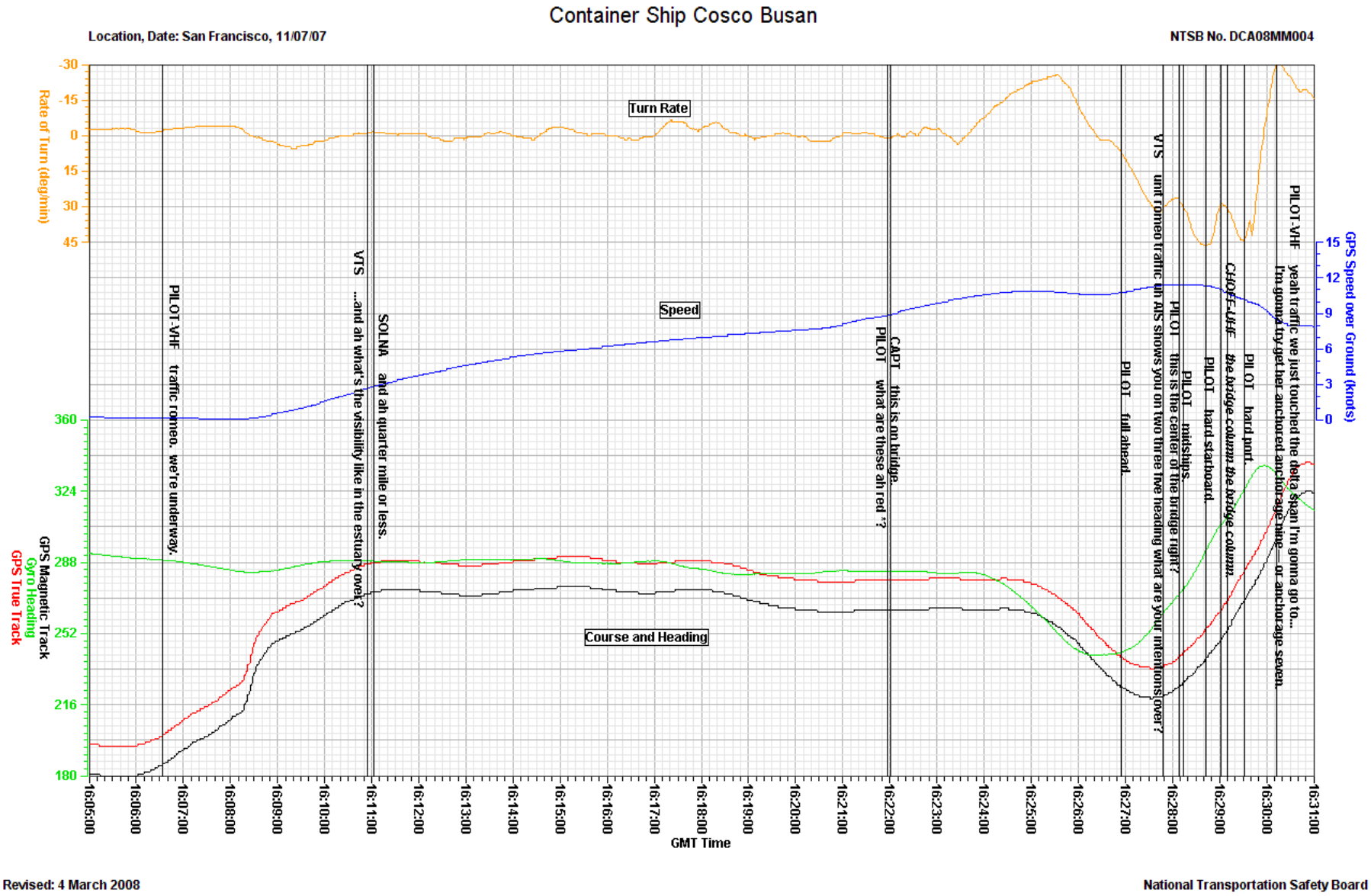

Figure 1 Entire Underway Period Until Impact

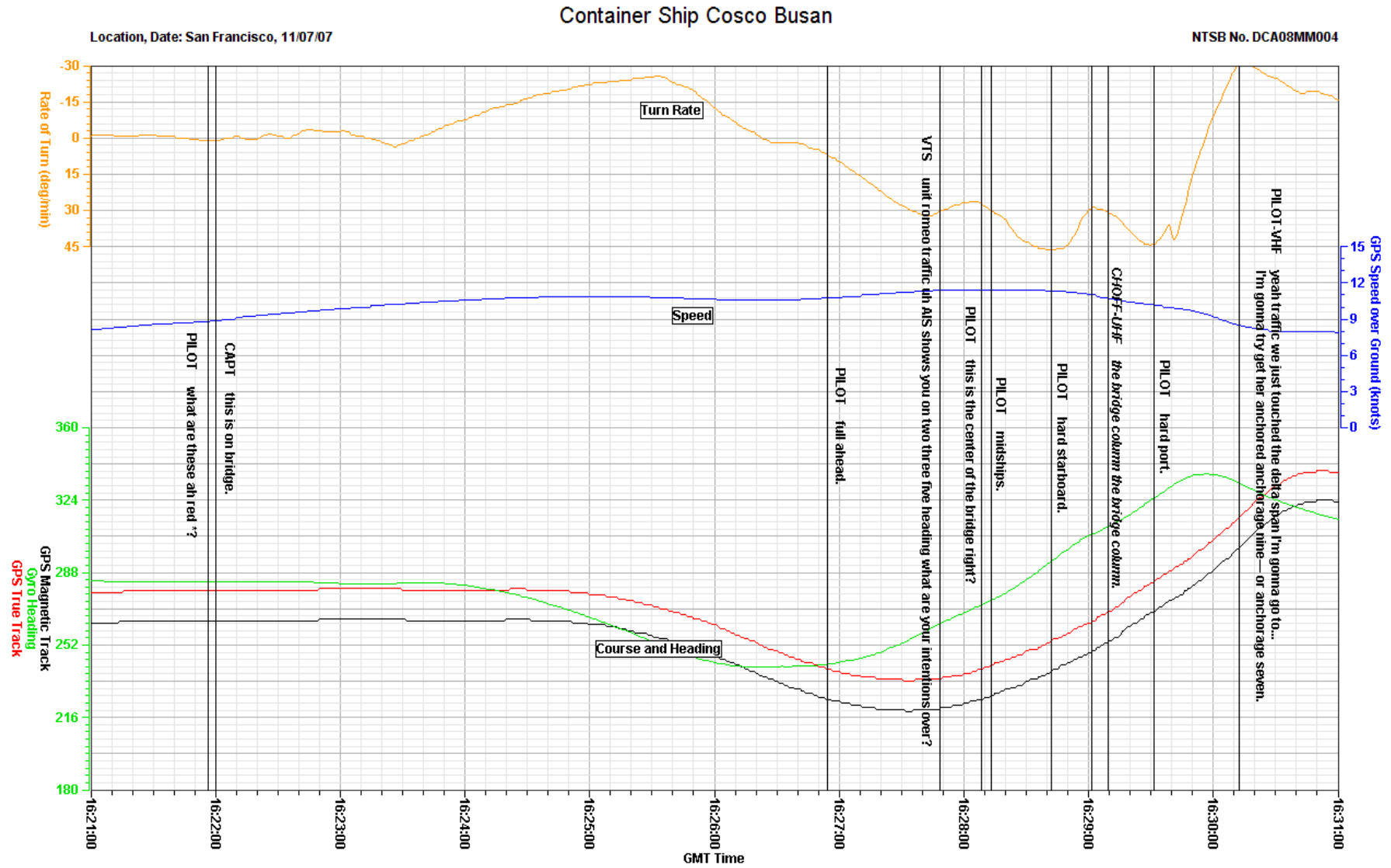

Figure 2 Ten Minutes Before Impact

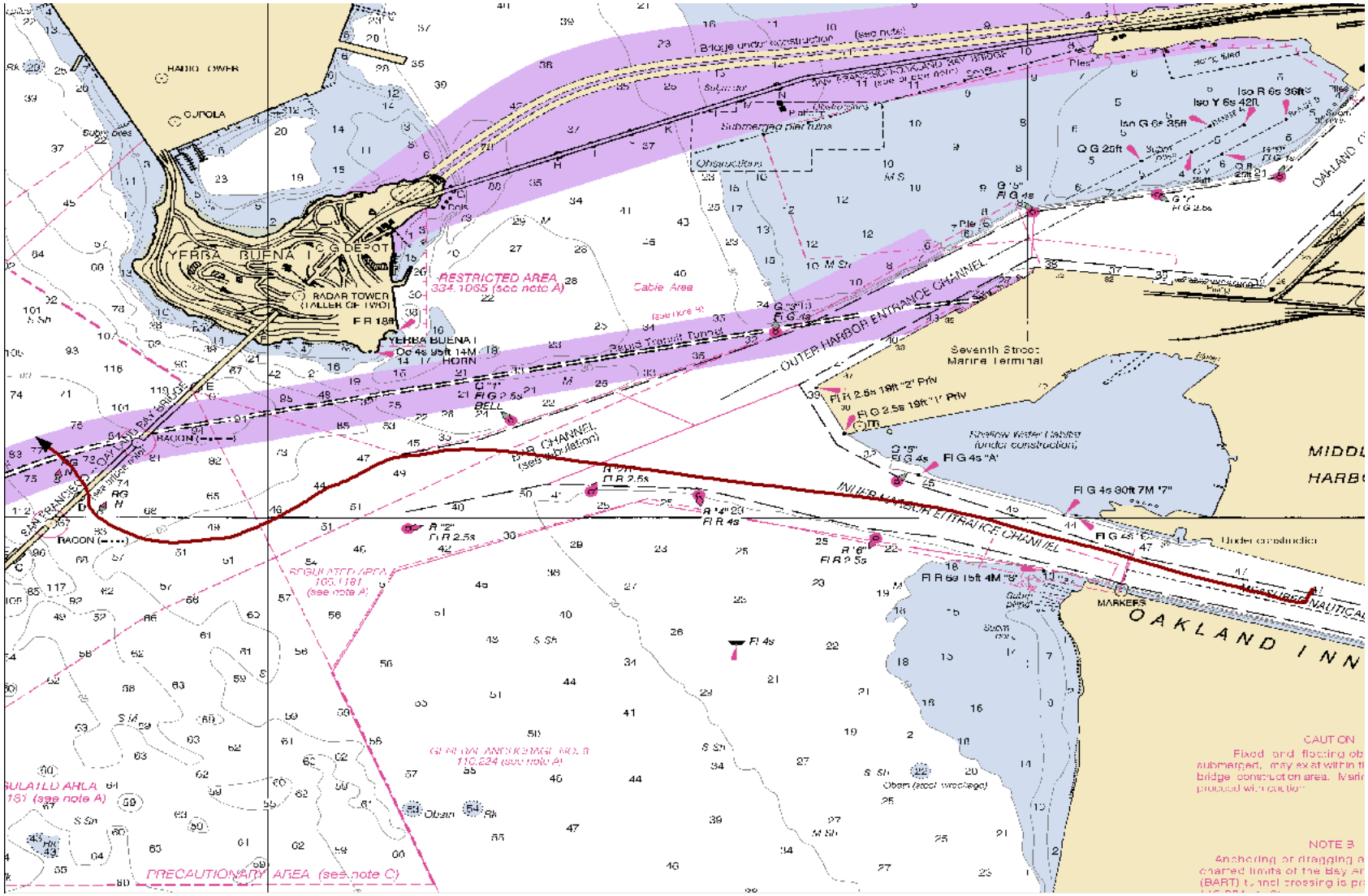

Figure 3 Track of Underway Period Until Impact

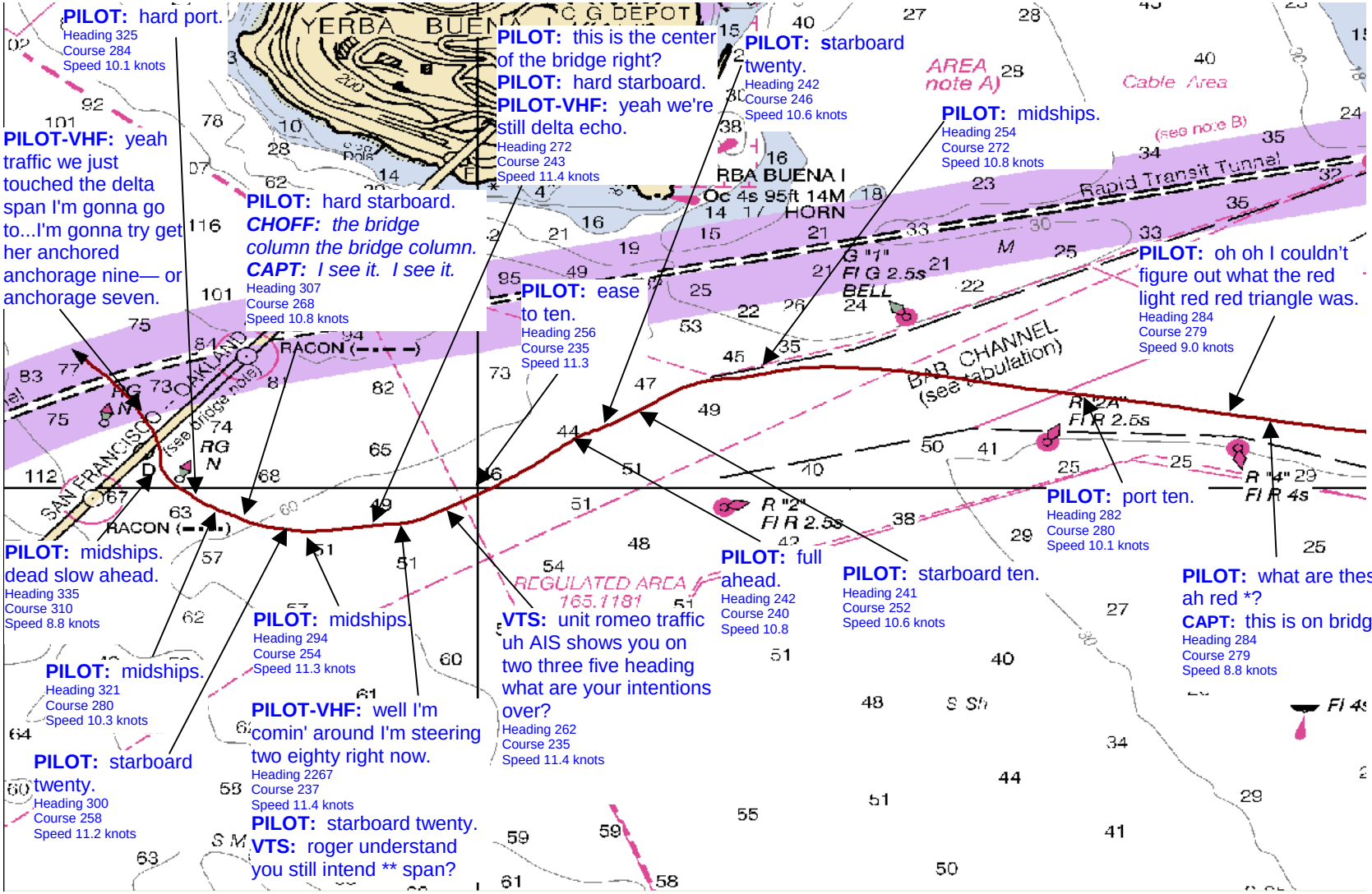

Figure 4 Ground Track Just Prior to Allision with Selected Audio